

Aug. 13, 1940.

C. F. HENNEY

2,211,568

REFRIGERATING APPARATUS

Filed June 27, 1934

5 Sheets-Sheet 1

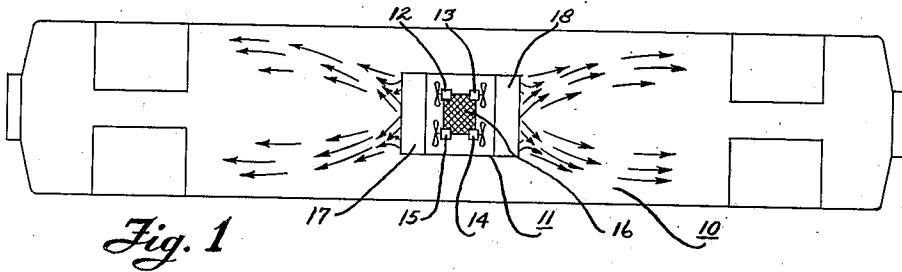


Fig. 1

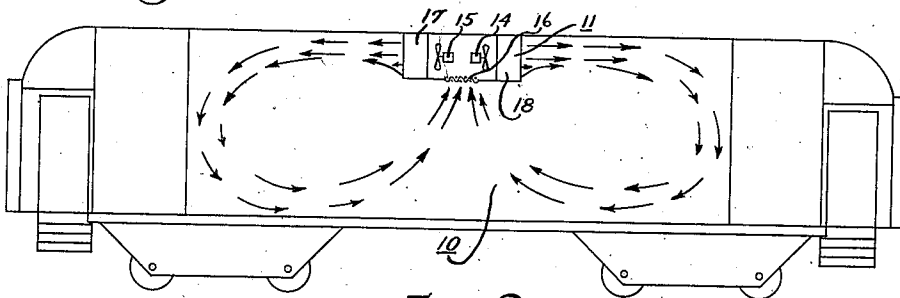


Fig. 2

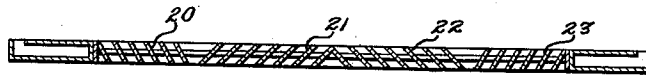


Fig. 4

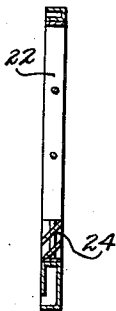


Fig. 5

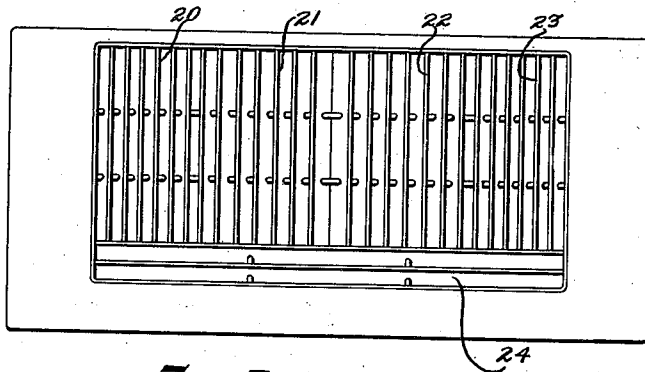


Fig. 3

Inventor
Charles F. Henney

Spencer Hardman & Allen
Attorneys

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C. F. HENNEY

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5 Sheets-Sheet 2

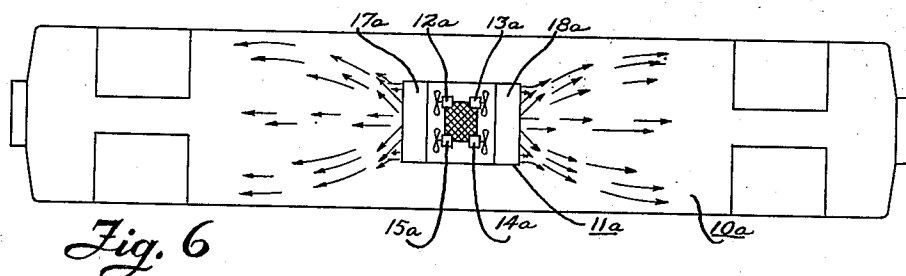


Fig. 6

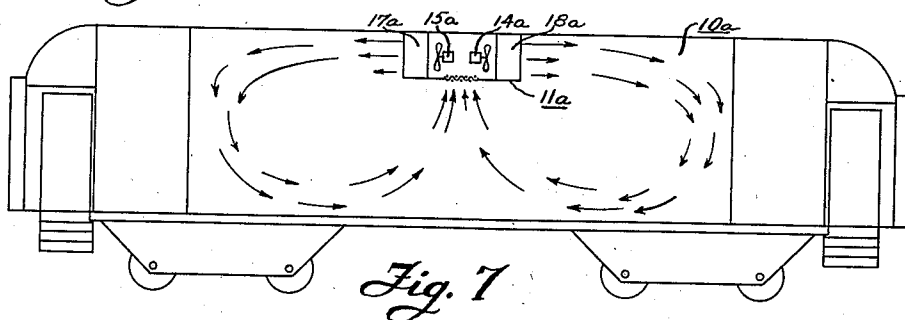


Fig. 7

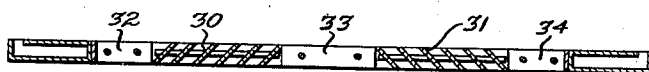


Fig. 9

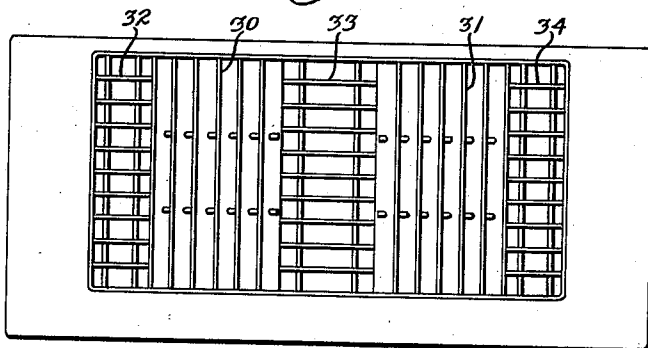


Fig. 8

Inventor

Charles F. Henney,

By *Spencer, Ferdinand & Asler*
Attorneys

Aug. 13, 1940.

C. F. HENNEY

2,211,568

REFRIGERATING APPARATUS

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5 Sheets-Sheet 3

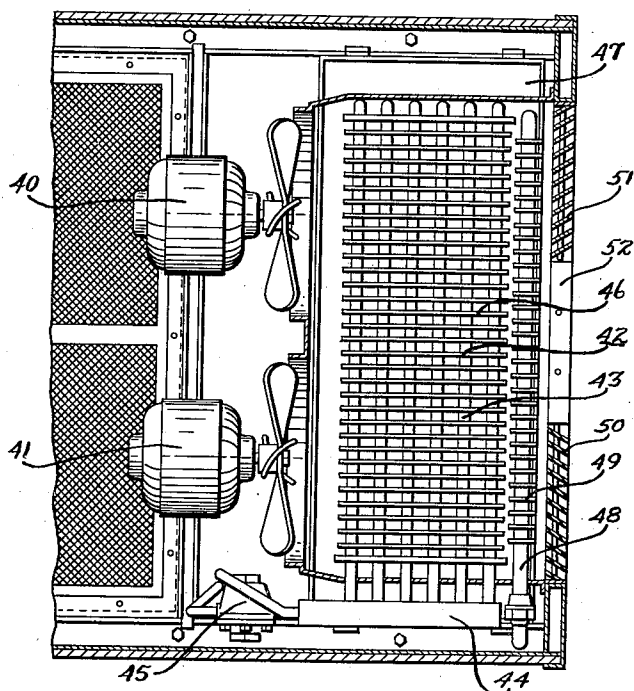


Fig. 10

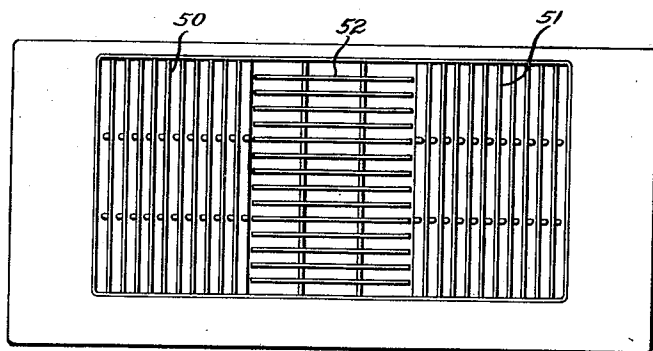


Fig. 11

Inventor

Charles F. Henney,

By Spencer, Hardman & Felt
Attorneys

Aug. 13, 1940.

C. F. HENNEY

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5 Sheets-Sheet 4

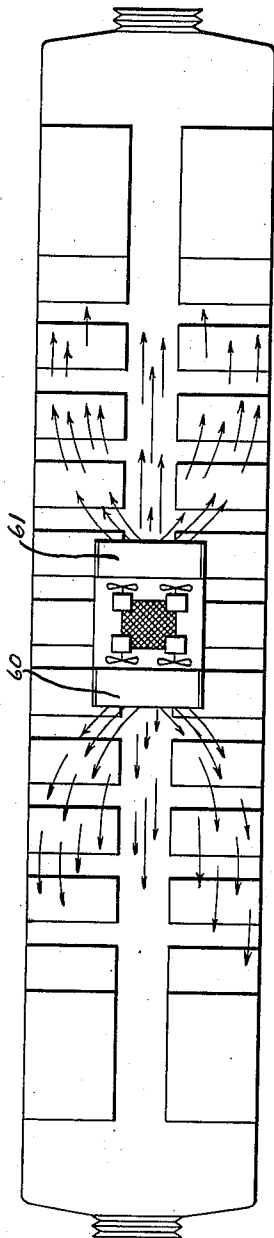


Fig. 12

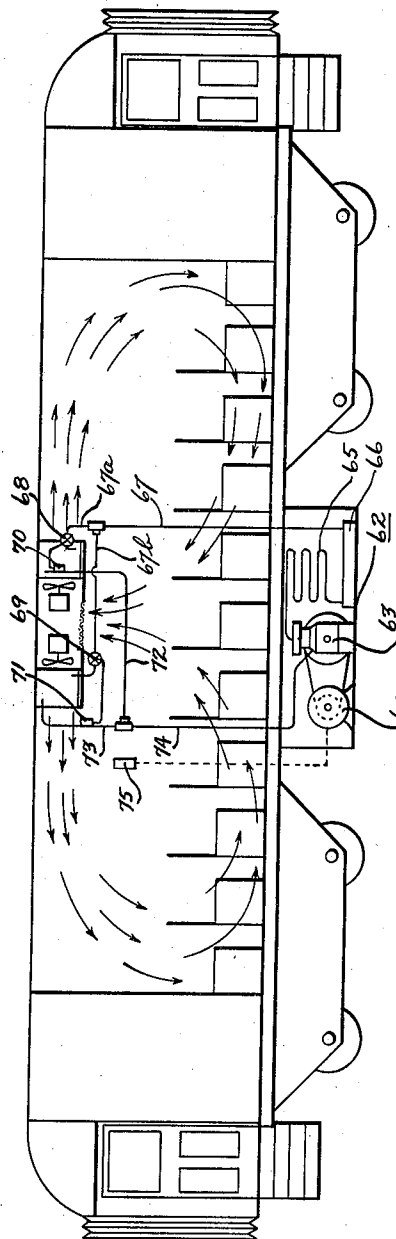


Fig. 13

Inventor

Charles F. Henney,

By *Spencer, Hardman & Apple*
Attorneys

Aug. 13, 1940.

C. F. HENNEY
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5 Sheets-Sheet 5

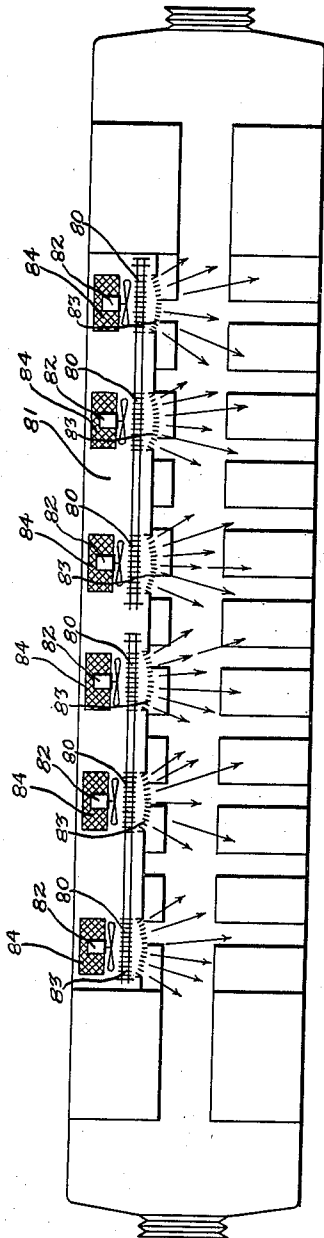


Fig. 14

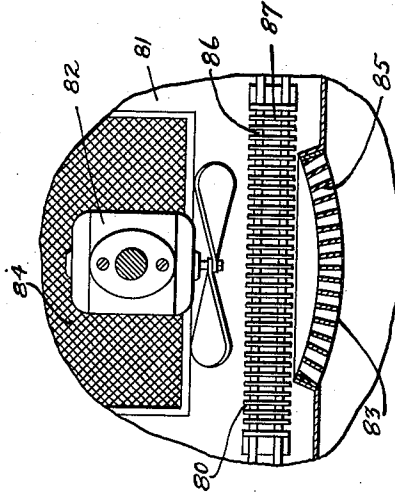


Fig. 16

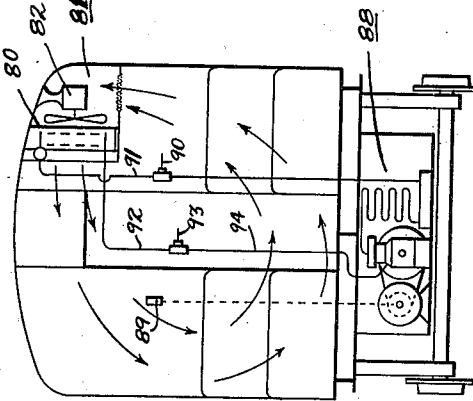


Fig. 15

Inventor
Charles F. Henney,

By *Spencer, Hardman & Felt*
Attorneys

UNITED STATES PATENT OFFICE

2,211,568

REFRIGERATING APPARATUS

Charles F. Henney, Dayton, Ohio, assignor to
General Motors Corporation, Dayton, Ohio, a
corporation of Delaware

Application June 27, 1934, Serial No. 732,692

2 Claims. (Cl. 98—114)

This invention relates to refrigeration and more particularly to a conditioning of air in enclosures.

It is an object of this invention to provide a method and apparatus for conditioning air in such a manner that the cooling structure may be placed above the head space in the enclosure to be conditioned and the air forced therethrough and discharged into the enclosure without causing objectionable drafts in the occupied space.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings, wherein a preferred form of the present invention is clearly shown.

In the drawings:

Fig. 1 is a diagrammatic plan view of a car to which my invention has been applied;

Fig. 2 is a diagrammatic vertical cross-sectional view of the car shown in Fig. 1;

Fig. 3 is a front elevation of a grille which may be placed adjacent the cooling coils to prevent objectionable drafts;

Fig. 4 is a horizontal cross-sectional view of the structure shown in Fig. 3;

Fig. 5 is a vertical cross-sectional view of the structure shown in Fig. 3;

Fig. 6 is a diagrammatic plan view, somewhat similar to Fig. 1, but having a slightly modified form of the invention;

Fig. 7 is a vertical diagrammatic view of the structure shown in Fig. 6;

Fig. 8 is a front elevation of a grille of the type to produce air currents as shown in Figs. 6 and 7;

Fig. 9 is a horizontal cross-sectional view of the structure shown in Fig. 8;

Fig. 10 is a horizontal cross-sectional view of an air cooling structure, showing a still further modified form of grille;

Fig. 11 is a front elevation of a modified form of grille and of the type shown in Fig. 10;

Fig. 12 is an enlarged diagrammatic plan view showing the general application of my invention;

Fig. 13 is a diagrammatic vertical view showing the application of the invention including the entire refrigerating system;

Fig. 14 is a plan view of a further modification;

Fig. 15 is a transverse cross-sectional view of a structure shown in Fig. 14; and

Fig. 16 is an enlarged horizontal cross-sectional view of one of the air coolers shown in Fig. 14.

In applying my invention to an enclosure such as a railway passenger car, a compartment 10 may be the one to be cooled and may be of the

type which is provided with a double row of seats. This space may be conditioned by providing a cooling structure 11 positioned above the head space in the enclosure 10. This cooling structure may include a plurality of motor-driven fans 12, 13, 14 and 15 which are adapted to withdraw air from the enclosure 10 through the grilled opening 16 in the bottom of the structure 11. These fans force air through the cooling structures 17 and 18, which may be evaporators of mechanical refrigerating systems. The air is then discharged into the upper portion of the space 10 and is diffused by a grilled structure by the characters shown in Figs. 3, 4, 5, 8, 9, 10 and 11. In the modifications shown in Figs. 3, 4 and 5, the grille structure includes a plurality of vertical baffles 20, 21, 22 and 23 which are arranged in banks as indicated in Fig. 4. Thus the baffles 20 form a 30° angle with the axis of the car. The baffles of the bank 21 form a 45° angle. The baffles 22 form a 45° angle, and the baffles 23 a 30° angle. The streams of air passing through the baffles 20 and 21 converge, and the streams of air passing through the baffles 22 and 23 also converge. However, since the baffles 21 and 22 are at a greater angle than the baffles 20 and 23 respectively, the two air streams thus formed diverge with respect to each other as shown in Fig. 1.

In addition, a plurality of baffles 24 is provided in which the baffles are placed horizontally in a transverse direction to the air flow and are upwardly inclined at substantially a 45° angle in the direction of the air flow. The air which passes through these baffles is given an upward force which tends to support the blasts of air emanating from the baffles 20 to 23 inclusive and prevents them from falling on the occupants of the car before the objectionable velocity is reduced.

In the modification shown in Figs. 6 to 9 inclusive the space 10a, the structure 11a, fans 12a, 13a, 14a, 15a and the cooling units 18a and 17a have substantially the same structure and function as the members 10 to 18 inclusive in Fig. 1. The grilles used in Figs. 6 and 7 are illustrated in Figs. 8 and 9. Here a plurality of vertical baffles 30 and 31 are placed in 45° angle with respect to the axis of the car, but diverge with respect to each other as the air flows through them. In addition, a plurality of horizontal baffles 32, 33 and 34 are placed adjacent to the baffles 30 and 31. The baffles 32 to 34 are preferably upwardly inclined in a manner similar to baffles 24. They impart an upward direction to

blasts of air which tend to mix and diffuse the air as it comes from the structure 11a and prevent any cold portions of air from dropping before the velocity is sufficiently dissipated.

Fig. 10 shows the type of evaporator used in the cooling structures of Figs. 1, 2, 6 and 7; but a slightly different grille is illustrated. The motor-driven fans 40 and 41 are the same as the motor-driven fans illustrated in Figs. 1, 2, 6 and 7 and force air through the evaporator structure 42. This structure includes a plurality of horizontal pipes 43 which are connected to a discharge header 44 at their upper ends. A similar intake header, not shown, but immediately below header 44 is connected to the expansion valve 45 and the refrigerant flows back and forth in a sinuous course through the various pipes 43 until it reaches the header 44 from whence it is discharged by a suitable pipe to the compressor. The expansion valve 45 may be controlled by a thermostat placed adjacent the outlet end of the evaporator to maintain the evaporator substantially flooded, as is usual. A plurality of vertical metal fins 46 bridge the entire pipe work and thus provide a plurality of vertical air passageways which extend from the top to the bottom of the evaporator and permit any water condensed thereon to trickle freely to the drain pan 47 placed underneath the evaporator. In addition a sinuous pipe structure 48, having vertical fins 49, may be placed in front of the evaporator 42. Steam may be admitted into this structure during the winter to heat or aid in heating the car and it may also be used to reheat the air which has been cooled by the evaporator 42, if desired.

The grille structure as shown in Figs. 10 and 11 may include a plurality of vertical baffles 50 and 51 which diverge from each other at a 30° angle with respect to the axis of the car. Horizontal upwardly directed baffles 52 are placed between the baffles 50 and 51 and provide the upward and sustaining current of air in a manner similar to that described with respect to Figs. 8 and 9.

A refrigerating system may be connected to the various evaporator structures heretofore referred to in the manner shown in Figs. 12 and 13. Thus the evaporator structures 60 and 61 may correspond to the heretofore described evaporators. These are connected to a refrigerant liquefying unit shown at 62. This unit may include a compressor 63 driven by a motor 64. The compressor discharges into a condenser 65 having a receiver 66 which is connected by the line 67 having branches 67a and 67b with the evaporators. The expansion valves 68 and 69 are provided at the intake of these evaporators and are horizontally controlled as indicated at 70 and 71 respectively. The evaporators discharge through the branches 72 and 73 to the suction line 74 which is connected with the compressor 63. The motor 64 may be started and stopped by an auto-

matic control 75 which may be a dry bulb or a wet bulb thermostat or a combination of both.

In the modification shown in Figs. 14 to 16 inclusive, a plurality of evaporators 80 are provided along the side of the car above the head room in the compartment 81. A plurality of motor-driven fans 82 forces air through the evaporators and through the grilles 83. The air is withdrawn through the intake openings 84 underneath the fans. The grilles 83 may comprise a plurality of diverging vertical baffles 85 as indicated in Fig. 16. The evaporators 80 may include horizontal sinuous pipe structures 86 similar to those described with respect to Fig. 10, and are provided with vertical fins 87 having free trickle ways similar to those in Fig. 10.

A refrigerant liquefying unit 88, similar to that shown in Fig. 13 discharges liquid refrigerant through the refrigerant line branches 90 and 91 to the various evaporators and the evaporated refrigerant is gathered through the branches 92 and 93 from the various evaporators to the suction line 94 which is connected to the compressor of the unit 88. The motor of the unit is controlled by an automatic control 89 similar to control 75. By reason of the diverging character of the baffles 85 air is diffused before it has an opportunity to drop in objectionable drafts into the space occupied by the passengers.

While the form of embodiment of the invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. A grille through which air may be blown comprising a frame, a series of vertical fins disposed in closely spaced parallel relation and fixedly mounted in said frame in edgewise relation to the general direction of air flow through the grille and a series of closely spaced horizontal fins disposed below said first mentioned series of fins and constructed and arranged so as to direct air passing therethrough upwardly into the air passing through said first mentioned series of fins, said second mentioned series of fins being fixedly mounted in said frame in edgewise relation to the general direction of air flow through the grille.

2. A grille through which air may be blown comprising a frame, a series of vertical fins disposed in closely spaced parallel relation and fixedly mounted in said frame in edgewise relation to the general direction of air flow through the grille and a series of closely spaced horizontal fins disposed adjacent said first mentioned series of fins and constructed and arranged so as to direct air passing therethrough into the air passing through said first mentioned series of fins, said second mentioned series of fins being fixedly mounted in said frame in edgewise relation to the general direction of air flow through the grille.

CHARLES F. HENNEY.